

**DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER QUALITY DIVISION
MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM**

Fact Sheet

Permittee:	Second Step Asset Management Company
Permit No.:	MT0030651
Receiving Water:	Flathead Lake
Facility Information:	Abbey Main House Shelter Island
Mailing Address:	Robert J. Benson, Vice President Second Step Asset Management Company CA9-193-14-39 333 S. Hope Street, 14 th Floor Los Angeles, CA 90071
Contact:	Casey Yarger, Onsite Property Manager 282 4 th Avenue, NW Kalispell, MT 59901 (406) 249-1252
Fee Information:	
Type:	Minor Privately Owned Treatment Works
Number of Outfalls:	1 (for fee determination purposes)
Type of Outfall:	001 – Non-contact Cooling Water

I. Permit Status

The MPDES permit for the Abbey Main House discharge of non-contact cooling water was issued to Donald G. Abbey on November 29, 2012, became effective on January 1, 2013 and has an expiration date of December 31, 2017. The Department of Environmental Quality (DEQ) received a Permit Transfer Notification (PTN) that transferred ownership of the Abbey Main House on Shelter Island to Second Step Asset Management Company effective April 20, 2016. DEQ modified the permit on April 20, 2016 to reflect the new owner. DEQ received a complete permit renewal application on June 30, 2017, and administratively extended the permit by letter dated July 12, 2017. The administratively extended permit is referenced in this Fact Sheet (FS) as the 2012-issued permit.

II. Facility Information

Current Facilities:

This is a non-contact cooling water discharge. The permittee has a privately-owned main house and boat house located on privately-owned Shelter Island off the west shore of Flathead Lake, near Rollins and due south of Indian Point. The heating and cooling system for the two buildings on the island utilizes water pumped from Flathead Lake through heat exchangers in four Mammoth Model F360WLH heat pumps serving the main house and one Mammoth Model F130WLH heat pump serving the boat house. The heating/cooling system also utilizes a Tranter Supercharger plate and heat exchanger, model GLD-013/M4/HP/130. A site visit on August 9, 2012 verified that water is withdrawn by two alternating Goulds 8RGLC, 15 horse power (hp) submersible pumps from Flathead Lake at a point located approximately 100 feet from shore, at a depth of about 26 feet, at a rate of 354 gallons per minute (gpm) to the closed-loop heat pump system. After one trip through the heating/cooling system, with no addition of chemicals and/or direct contact with heat exchanger fluid, the water is returned to Flathead Lake at a depth of approximately 53 feet and at a point located approximately 30 feet to the southeast of the location of the submersible pumps. The location of the discharge point is 47°53'37.4" N latitude, 114°10'22.4" W longitude.

The permittee holds a permit from the Montana Department of Natural Resources and Conservation (DNRC) to withdraw a maximum of 354 gpm from Flathead Lake for geothermal use on Shelter Island. The permittee also holds a permit from DNRC for use of up to 5.19 acre-foot (AF) annually from the geothermal withdrawal for consumptive use on Shelter Island.

Associated with the 2012-issued permit renewal, consultants for Don Abbey, Applied Water Consulting LLC (AWC) utilized EPA Visual Plumes modeling software UM3 to simulate the effluent discharge at the Abbey site under existing (as-built) conditions. The software simulates single and merging submerged plumes in stratified ambient flow and buoyant surface discharges.

With the as-built location of the lake water intake pumps at a depth of only 26 feet, intake water temperatures fluctuate much more than anticipated with the original design where the intake was located below the thermocline. Intake water temperatures, at the actual location of the intake pumps, range from about 70°F in the summer months to 40°F or colder in the winter months. At these intake temperatures, the heat pump manufacturer calculated that the maximum effluent temperature in the summer months will be 79°F (a 9°F increase over intake water temperature) and the minimum effluent temperature in the winter months will be 35°F (a 5°F decrease from intake water temperature). The Visual Plumes modeling effort utilized the temperature increases and decreases that result from the actual (above the thermocline) location of the intake pumps rather than the conditions predicted from the original design.

Table 1 shows the effluent characteristics of the discharge from Outfall 001 for the period of record (POR) of January 2015 through December 2017.

Table 1: Effluent Characteristics for the Period January 2015 through December 2017

Parameter	Units	2012-Issued Permit Limits	Minimum	Maximum	Average	Number of Samples
Flow	gpm	-	95	384	207	(1)
Temperature	°F	35 – 79 ⁽²⁾	35	79	(3)	(3)
pH	s.u.	6.0 – 9.0 ⁽⁴⁾	7.7	8.8	(4)	(4)

Footnotes:
 1. Monthly average flows reported only from April 2016 through December 2017 (21 mo.). Maximums & minimums are from entire POR (36 mo.). Effluent flows are monitored continuously.
 2. Effluent temperature not to exceed 79°F or be less than 35°F.
 3. Effluent temperature monitored daily. Only maximums & minimums reported for each month.
 4. pH not to exceed 9.0 s.u. or be less than 6.0 s.u. Monthly monitoring required, monitored more frequently & reported maximums & minimums for each month.

The 2012-issued permit also required daily monitoring of the intake water and reporting of the maximum and minimum values measured. The maximum value reported was 70°F and the minimum value reported was 33°F. During the heating months (November through April) of the POR, the intake water low temperatures reported averaged 35°F and the high temperatures reported averaged 41°F. During the cooling months (May through October) of the POR, the intake water low temperatures reported averaged 50°F and the high temperatures reported averaged 64°F.

The discharge did not violate any permit limits during the POR, but did equal the maximum allowed effluent temperature on one occasion and equaled the minimum allowed effluent temperature on three occasions.

As indicated earlier, the site visit on August 9, 2012 showed that the lake water intake was not located at a depth that would assure withdrawal of water from below the thermocline, which reportedly occurs at a depth of about 39 feet, as originally planned. As a result, the temperature of the water withdrawn varies widely dependent on the season. For example, the original heat pump design relied on water withdrawn for cooling purposes to be in a temperature range of 42 - 46°F. However, because of the relatively shallow depth of the intake, summer water temperatures at times reach 70°F. Conversely, the intake water temperature during the winter months is colder than anticipated. During the site visit on August 9, 2012, it was reported that using the heat pumps for heating purposes does not work satisfactorily if the intake water is colder than 50°F.

III. Technology-based Effluent Limits

a. Applicability to Technology-based Limits

The Montana Board of Environmental Review, in ARM 17.30.1207, adopted by reference 40 Code of Federal Regulations (CFR) Subpart N which is a series of federal agency rules that set forth technology-based effluent limits (TBELs) for existing sources. National Effluent Limitations Guidelines (ELG) have not been promulgated under Subpart N for small heat exchange systems or non-contact cooling water discharges. However, thermal discharges are subject to technology-based requirements in Section 301(b) of the federal Clean Water Act.

IV. Water Quality-based Effluent Limits

a. Scope and Authority

Permits are required to include water quality-based effluent limits (WQBELs) when TBELs do not exist or are not adequate to prevent excursions of state water quality standards. No wastes may be discharged that can reasonably be expected to violate any state water quality standards. Montana water quality standards define both water use classifications for all state waters and numeric and narrative standards that protect those designated uses.

State surface waters must be free from substances attributed to discharges that will:

- (a) settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines;
- (b) create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials;
- (c) produce odors, colors, or other conditions as to which create a nuisance or render undesirable tastes to fish flesh or make fish inedible;
- (d) create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life; and
- (e) create conditions which produce undesirable aquatic life.

b. Receiving Water

The combined discharge of non-contact cooling water from the main house and boat house, located on Shelter Island on Flathead Lake, is to Flathead Lake. Flathead Lake is classified as A-1 according to Montana Water Use Classifications. Waters classified A-1 are to be maintained suitable for drinking, culinary, and food processing purposes, after conventional treatment for removal of naturally present impurities. Water quality must be maintained suitable for bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

Flathead Lake is located within the Flathead River watershed identified as United States Geological Survey (USGS) Hydrological Unit Code (HUC) 17010208 and Montana stream segment MT76O003_010. Flathead Lake is listed as not fully supporting the beneficial use of

aquatic life on the draft 2018 303(d) list. Identified probable causes for the impairment were mercury, total nitrogen, total phosphorus and polychlorinated biphenyls (PCBs). Probable sources of impairment are listed as atmospheric deposition, hydrostructure flow regulation/modification, municipal point source discharges, silviculture harvesting, unspecified urban stormwater, upstream impoundments and unknown sources. TMDLs have been completed for Flathead Lake for total nitrogen and total phosphorus. Temperature is not listed as an impairment or as a probable cause for the impairments identified on the draft 2018 303(d) list.

A discussion of Flathead Lake water temperatures was presented in the 2003 permit application and again by AWC associated with the Visual Plume modeling effort discussion. The temperature data presented were described as having been collected from Ross Deep and Big Arm Bay by the Flathead Lake Biological Station. Based on the temperature data for Flathead Lake in the general vicinity of Shelter Island, the thermocline was thought to typically begin at a water depth of 39 feet. A temperature profile taken near the east side of Shelter Island on August 17, 2012 by AWC, affirmed a summer thermocline at a depth of about 47 feet. The AWC data were comparable to the temperature profile taken by the Flathead Lake Biological Station at Ross Deep (in Big Arm Bay) on August 17, 2002, which also found the thermocline at a depth of about 47 feet.

c. Water Quality Standards

Discharges to surface waters classified A-1 are subject to the specific water quality standards of ARM 17.30.622, CIRCULAR DEQ-7 (DEQ-7), and the general provisions of ARM 17.30.635 through 637. Discharges are also subject to ARM 17.30 Subchapter 5 (Mixing Zones) and Subchapter 7 (Nondegradation of Water Quality), and Circular DEQ-12A (Montana Base Numeric Nutrient Standards).

d. Mixing Zone

A mixing zone is an area where effluent mixes with the receiving water and certain water quality standards may be exceeded. A mixing zone must be of the smallest practicable size, have a minimum effect on water uses, and have definable boundaries. No mixing zone will be granted that will impair beneficial uses. Acute standards for any parameter may not be exceeded in any portion of the mixing zone unless the Department specifically finds that allowing minimal initial dilution will not threaten or impair existing beneficial uses. Beneficial uses relative to growth and propagation of salmonid fishes and associated aquatic life are considered to be protected if the discharge does not block passage of aquatic organisms or cause acute lethality to aquatic organisms passing through the mixing zone.

The Department will determine the applicability of a mixing zone and, if applicable, its size, configuration, and location. Mixing zones are considered on a case-by-case basis. The Department may decide to not grant a mixing zone or may decide to grant one of the four types of mixing zones, i.e. nearly-instantaneous, standard, alternative or source-specific mixing zone. Mixing zones are granted on a parameter-by-parameter basis only and are not granted for TBELs based on national secondary treatment standards, effluent guidelines or other technology-based standards.

For lakes, the area of a mixing zone must not exceed 5 % of the area of the lake or extend more than a 200-foot radius from the discharge, whichever is more restrictive.

The applicant requested a source specific mixing zone for the non-contact cooling water discharge in the original permit application of April 2003. The application received in February 2008 for renewal of the permit for discharge of non-contact cooling water to Flathead Lake, again requested a source specific mixing zone and provided a copy of the original submittal, complete with a copy of the original Cormix modeling effort submitted in 2003. Since the location of the intake water pumps is different than originally designed (see discussions in Section II), a different modeling effort was undertaken by AWC using EPA's Visual Plume software UM3 (see previous discussion in Section II).

For purposes of modeling the mixing zone of the effluent discharge for the Abbey main house and boat house, one summertime (stratified temperature) and three wintertime (mixed unstratified temperature) conditions were considered. The summertime condition used a worst-case scenario of an effluent temperature of 79°F and an ambient water temperature at the discharge point of approximately 54°F. The wintertime conditions modeled (all at the discharge point) included: a discharge temperature of 37°F to an ambient water temperature of 42°F; a discharge temperature of 35°F to an ambient water temperature of 40°F; and a discharge temperature of 41°F to an ambient water temperature of 45°F. The summertime stratified model yielded the largest thermal plume and is controlling. Modeling showed that under the worst-case scenario the summertime discharge cooled to within 1°F of ambient water temperature within a horizontal distance of 45.9 feet from the end of the discharge pipe.

The source specific mixing zone granted in the 2012-issued permit will be granted in the renewed permit with a 46-foot radius from the end of the discharge pipe, which approximates the results of the Visual Plumes modeling effort within which mixing would be complete and water quality standards for maximum allowable temperature increase and/or decrease would be met. The end of the discharge pipe is approximately 130 feet from the shore of Shelter Island at a depth of approximately 53 feet.

e. Basis for WQBELs (Reasonable Potential and Calculations)

Permits are required to include WQBELs when TBELs are not adequate to protect water quality standards and no wastes may be discharged that can reasonably be expected to violate any standard. The need for WQBELs is determined based on reasonable potential (RP) calculations for certain pollutants to determine if numeric or narrative water quality standards may be exceeded. For conservative materials (pollutants), the Department uses a mass balance equation (Equation 1) to determine reasonable potential based on the *EPA Technical Support Document for Water Quality-based Toxics Control* (TSD)(EPA/505/2-90-001) and DEQ-7.

$$C_{RP} = \frac{C_E Q_E + C_S Q_S}{Q_E + Q_S} \quad (\text{Equation 1})$$

Where:

C_{RP} = receiving water concentration (RWC) after mixing, mg/L

C_E = effluent concentration, mg/L
 C_S = RWC concentration upstream of discharge, mg/L
 Q_S = applicable receiving water flow, mgd
 Q_E = facility design flow rate, mgd

Equation 1 is not appropriate for calculation of RP for a non-conservative pollutant, such as temperature. An alternative to Equation 1 is a hydrodynamic mixing model such as Visual Plumes to show the impact of pollutants. As discussed previously, the modeling effort undertaken in 2012 by AWC, using the Visual Plumes software UM3 under maximum heat loss and heat gain conditions in the effluent, showed compliance with the water quality standards for maximum allowable temperature change of 1°F in Flathead Lake within approximately 46 feet of the end of the discharge pipe. Since a mixing zone will be granted extending 46 feet in all directions from the end of the discharge pipe, RP should not exist beyond the mixing zone.

Effluent limits will be developed that will equal the maximum and the minimum temperatures used in the modeling. Those temperatures are a maximum discharge temperature of 79°F and a minimum temperature of 35°F (same as the 2012-issued permit).

The effluent limits for pH in the renewed permit will remain the same minimum and maximum values as in the 2012-issued permit, i.e. 6.0 s.u. and 9.0 s.u. The mixing zone granted for temperature will also be granted for pH, which will assure that the water quality standards for maximum pH increase or decrease of 0.5 s.u. will be met outside of the mixing zone.

V. Final Effluent Limits

Beginning on the effective date of the permit and lasting through the term of the permit, the quality of effluent discharged by the facility through Outfall 001 shall, as a minimum, meet the limits as set forth below:

Temperature: Effluent temperature shall not exceed 79°F or be less than 35°F.

pH: Effluent pH shall remain between 6.0 and 9.0 s.u. (instantaneous minimum and instantaneous maximum). For compliance purposes, any single analysis or measurement beyond this limit shall be considered a violation of the conditions of this permit.

VI. Self-Monitoring & Other Requirements

a. Self-Monitoring

Effluent flow measurements must be taken from the effluent discharge line. A flow recording device or totalizing unit is required. Effluent samples for all parameters must be obtained from the sampling port on the effluent discharge line.

Table 2: Effluent Monitoring Requirements						
Parameter	Unit	Sample Location	Sample Frequency	Sample Type ⁽¹⁾	Reporting Requirements	Reporting Level
Flow	gpm	Effluent	Continuous	Instantaneous ⁽²⁾	Ave Day & Max Day	1
Temperature	°F	Effluent	1/Day	Instantaneous	Monthly Min & Monthly Max	1
pH	s.u.	Effluent	1/Week	Grab	Min & Max	0.1
Footnotes: 1. See Definition section at end of permit for explanation of terms. 2. Requires recording device or totalizer.						

Table 3: Intake (Flathead Lake) Monitoring Requirements						
Parameter	Unit	Sample Location	Sample Frequency	Sample Type ⁽¹⁾	Reporting Requirements	Reporting Level
Temperature	°F	Intake Line	1/Day	Instantaneous	Monthly Min & Monthly Max	1
Footnotes: 1. See Definition section at end of permit for explanation of terms.						

VII. Nonsignificance Determination

Flathead Lake is high quality water as defined in 75-5-103(10), MCA and consideration of the non-contact cooling water discharge as a possible new source is appropriate since it commenced after April 29, 1993. However, in accordance with activities causing nonsignificant changes in existing water quality are not considered new or increased sources.

An activity will result in nonsignificant changes to existing water quality if, for any harmful parameter for which water quality standards have been adopted (temperature is a harmful parameter), the changes outside of a mixing zone designated by the Department are less than 10% of the applicable standard. The modeling by Visual Plumes software UM3 discussed in Section IV shows that no exceedence of the water quality standard for temperature change in Flathead Lake will occur outside the mixing zone of 46 feet from the end of the discharge pipe. Therefore, the test for nonsignificance has been met.

VIII. Public Participation

a. Public Notice

In accordance with ARM 17.30.1372, DEQ issued Public Notice No. MT-18-10 dated June 18, 2018. The public notice states that a tentative decision has been made to issue an MPDES permit to the Permittee and that a draft permit, fact sheet and environmental assessment (EA) have been prepared. Public comments are invited any time prior to the close of the business on July 18, 2018. Comments may be directed to:

Department of Environmental Quality
Water Protection Bureau
PO Box 200901
Helena, MT 59620

or

DEQWPBPublicComments@mt.gov

All comments received or postmarked prior to the close of the public comment period will be considered in the formulation of the final permit. DEQ will respond to all substantive comments and issue a final decision within sixty days of the close of the public comment period or as soon as possible thereafter.

All persons, including the applicant, who believe any condition of a draft permit is inappropriate or that DEQ's tentative decision to deny an application, terminate a permit, or prepare a draft permit is inappropriate, shall raise all reasonably ascertainable issues and submit all reasonably available arguments supporting their position by the close of the public comment period (including any public hearing) under ARM 17.30.1372.

b. Notification of Interested Parties

Copies of the public notice were mailed to the discharger, state and federal agencies and interested persons who have expressed an interest in being notified of permit actions. A copy of the distribution list is available in the administrative record for this permit. In addition to mailing the public notice, a copy of the notice and applicable draft permit, fact sheet and EA were posted on DEQ's website for 30 days.

Any person interested in being placed on the mailing list for information regarding this MPDES permit should contact DEQ, reference this facility, and provide a name, address, and email address.

c. Public Hearing

During the public comment period provided by the notice, DEQ will accept requests for a public hearing. A request for a public hearing must be in writing and must state the nature of the issue proposed to be raised in the hearing (ARM 17.30.1373).

d. Permit Appeal

After the close of the public comment period DEQ will issue a final permit decision. A final permit decision means a final decision to issue, deny, modify, revoke and reissue, or, terminate a permit. A permit decision is effective 30 days after the date of issuance unless a later date is specified in the decision, a stay is granted pursuant to ARM 17.30.1379, or the applicant files an appeal pursuant to 75-5-403, MCA.

The Applicant may file an appeal within 30 days of DEQ's action to the following address:

Secretary, Board of Environmental Review
Department of Environmental Quality
1520 East Sixth Avenue
PO Box 200901
Helena, Montana 59620-0901

e. Additional Information

Requests for additional information or questions regarding this permit should be directed to the Water Protection Bureau at 406-444-3080.

IX. Information Sources

- a. Federal Water Pollution Control Act (Clean Water Act), 33 U.S.C. §§ 1251-1387, October 18, 1972, as amended 1973-1983, 1987, 1988, 1990-1992, 1994, 1995 and 1996.
- b. US Code of Federal Regulations, 40 CFR Parts 122-125, 130-133, & 136.
- c. Montana Code Annotated (MCA), Title 75-5-101, *et seq.*, "Montana Water Quality Act," 2011.
- d. Administrative Rules of Montana Title 17 Chapter 30 - Water Quality
 - Subchapter 2 - Water Quality Permit and Application Fees.
 - Subchapter 5 - Mixing Zones in Surface and Ground Water.
 - Subchapter 6 - Montana Surface Water Quality Standards and Procedures.
 - Subchapter 7- Nondegradation of Water Quality.
 - Subchapter 12 - Montana Pollutant Discharge Elimination System (MPDES) Standards.
 - Subchapter 13 - MPDES Permits.
- e. Montana Department of Environmental Quality Circular DEQ-7, Montana Numeric Water Quality Standards, October 2012.
- f. Integrated 303(d)/305(b) Water Quality Report for Montana (draft 2018).

- g. US EPA National Pollutant Discharge Elimination System (NPDES) Permit Writers' Manual, EPA 833-K-10-001, September 2010.
- h. MPDES Permit Number MT0030651:
 - 1. Administrative Record.
 - 2. Renewal Application DEQ Form 1 and EPA Form 2E, June 2017.
- i. Applied Water Consulting LLC correspondence of August 30 and September 17, 2012 regarding Visual Plumes Modeling and related information re/Abbey Main House discharge.

FS Prepared By: James F. Brown, May 2018